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ABSTRACT

The paper suggests ways to coordinate basic social studies skills to achieve the goal of developing reasoning ability in elementary and secondary students. The first three sections present a rationale for teaching the reasoning process in the social studies curriculum. The author stresses that in order to be an effective thinker, one should be aware of the nature and structure of inductive and deductive conclusions. The next section categorizes skills according to three levels. The lowest level, facilitating skills, includes observation, classification, seriation, and spatial relationships. The second level, processes, comprises inferring, predicting, measuring, and formulating and testing hypotheses and models. The third level, operations, includes search, group participation, communication, quantitative interpretation, and social judgment. Together, the three levels are interrelated and move toward the refinement of reasoning abilities. The author then examines in detail the facilitating skill of classification. Classification is noted as the skill which forms the foundation upon which language use and development is built. Types of classification are disjunctive (either/or), inclusive (one set is a subset of another set), or some/all (overlapping sets). The final section discusses curriculum implications. A structure based on the development and interaction of the three skill levels is suggested. (KC)

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REASONING AS A METAPHOR FOR SKILL DEVELOPMENT IN THE SOCIAL STUDIES CURRICULUM

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ED178432

Introduction

Since the recent back-to-basics movement in education, there has been a great deal of interest and concern about skill development in general, and social studies educators have been particularly preoccupied with the relationship of their instructional programs to student competencies in basic skill areas.[1] While these efforts are extremely important, there is a serious concern that many teachers and curriculum developers share, and that is the omission of any sense of coordination of skills towards a common objective. To be sure, topics such as "problem solving" and "decision-making" seem to point to a common objective, but little systematic attention is given to the relationship of "decision-making," for example, to other "basic" objectives such as reading and writing; to say nothing of relationships to "complex" objectives such as hypothesis formation and testing. Skills are, for the most part, taught in isolation and often result in program fragmentation and inefficient use of teacher/learner time.[2]

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Our purpose here is to explore one way of bringing skills together and point them toward a common goal... that is, the goal of reasoning. A rationale for reasoning will be developed, followed by a theoretical model that attempts to lessen the fragmentation of skills instruction. Finally, through an example of one skill, we will investigate the interrelatedness of said skill to student reasoning ability.

It is interesting to note the number of objectives, in all subject areas, that state some attribute of reasoning without attention to any more or less complete curriculum strategy to attain this objective. Even a cursory examination of curriculum materials in areas such as reading, social studies, mathematics, science or language arts suggests a number of objectives which call upon the learner to "compare and contrast," "determine cause-effect relationships," "detect or perceive specious logic or reasoning," "infer a reasonable conclusion," "develop a generalization based upon examination of given data." As a matter of fact, we could go on for some time delineating curriculum objectives which are common in their use of "reasoning rhetoric." It may be the case, moreover, that reasoning is not only non-specific relative to a given subject, but in some cases, it is not even specific to language or culture.[3] Further, if we look at course outlines and subject matter curriculum guides and materials, then it also appears that although the quantities and qualities of discourse modes vary in different disciplines, the kinds of skills required to function adequately in all areas seen to be common in that they address reasoning abilities. Yet in spite of this, specific attention to instruction in a comprehensive and coordinated set of skills which lead to reasoning is tangential at best to the the social studies curriculum area. It is, in fact, an irony of the strangest sort which has excluded from serious direct instructional intention what is perhaps the most fundamental concern of education... the development of reasoning abilities.

Reasoning Abilities

Reasoning abilities are not "merely" a function of intellectual development. To be sure, the child learns to classify, to abstract, to perform the mental tasks required of things such as Piaget's binary operations sets through the stage of formal operations. He or she will to some degree grow into "an ability to conceptualize, to generalize, to hypothesize." Of equal importance here, however, is

the notion[4] that those reasoning abilities which do develop as a general function of cognitive maturing are not refined without conscious instruction. The subtlety, nuance, and sharpness of reasoning do not just happen. It appears unlikely, for instance, that learners will develop the ability to detect fallacious conclusions in a deductive mode given reasonable premises.[5] Or the ability to discern and use varying senses of "because"[6] is not present in many adults and older students, yet would appear a crucial skill for effective reasoning in either a formal or informal situation. For example, "because" can be used to establish a cause/effect relationship, to show a justification for knowing, or as a tautology. As causal usage we might say that, "John failed the exam because he didn't study." As a justification for knowing we might say that, "Alice is not in school because we saw her downtown." And, as a tautology (definition) we could assert that, "She is a doctor because she has an MD degree." All uses of "because" become extremely important in coping with human discourse.

Learners in neither concrete operations nor the state of formal reasoning are able to distinguish between necessary and sufficient conditional.[7] Also, a majority of high school twelfth graders do not perceive the restrictions of antecedent-consequent relationships in casual assertions[8] and reasoning in the deductive modes continues to plague learners right through adulthood.[9]

A conscious and formal commitment to the teaching of reasoning is crucial. Yet, this is not attended to in a serious and systematic fashion in either commercially prepared materials or in locally developed curricula. A review of currently available materials reveals nearly a complete lack of attention to the structured development of reasoning. Activities in classification, to be sure, are to be found, but they are scattered throughout many early reading programs and in some science materials. Seriation or ordering skills are addressed in some social studies programs and in selected composition materials. Spatial relationships are

introduced in some math programs. And attention is given to inductive and deductive processes in only varying degrees in most subject areas.

Reasoning

Reasoning must always be seen within a particular time frame. "Reasoning" in the tenth century was certainly different from "reasoning" during the Enlightenment. Different times have their unique thought paradigms and we should note at the beginning that our paradigms for thinking are time-bound. That is, we use symbolic (modern) logic and the conceptual framework of inductive, deductive, and analogical structures knowing full well that they are only analytical devices we use to build curriculum and have less to do with how we think. In a very broad sense, and as the term is used here, all reasoning may be thought of as trying to reach a conclusion about some event, action, object, idea or, more often, series of same which appears important enought to warrant our attention. More often than not, the utilization of reasoning or those mental operations which necessarily lead to some sort of conclusion, take place unconsciously. The young child who finally concludes that touching a hot burner on the stove will result in pain or that striking a suspended mobile will cause it to move is using reasoning skills which in the course of time become internalizations and cause the individual to alter or adopt certain behaviors.

For adults, the processes of reasoning are normally of two sorts, inductive or deductive.* In both cases, a conclusion is drawn from the evidence of previously stated or observed data. The one basic difference between the two forms of reasoning is that in inductive reasoning, the extrapolation or "inductive leap" is made. If X + Y appear together 100 times and Z results, it may be safe to say

*Very young children, according to developmental psychologists such as Piaget, reason neither inductively or deductively, but rather "transductively." That is, they reason by association. The mere presence of one things or event is enough to presume a cause of another. "Clouds pushed the sun across the sky" or "the wind makes the clouds" are cases in point.

that X + Y when appearing together in this order will lead to Z. However, it is always a probability inference with some chance... no matter how infinitesimal... that some other result will occur. We're all willing to infer that the people we meet on the street will be wearing clothing and feel comfortable with that conclusion inspite of the fact that we might stumble across someone who is naked.

Thus, in an inductive argument the conclusion is at most only logically probable, not necessary.

With deductive reasoning, though, the conclusion is a necessary one if the observations are all true or accurate and if one had utilized a proper deductive form. If I say, "if the sun shines we will have a picnic," and, in fact, the sun does shine, then one may infer that we will have a picnic and know that such is a certainty unless I lied. In other words, in deductive arguments, true observations necessarily entail a particular conclusion.

In order to be an effective thinker, one should be aware of the nature and structure of both inductive and deductive conclusions as these conclusions work to reinforce each other. The more effective thinker consciously utilizes both in every day actions, personal discourse and in every appropriate context. But, the ability to think effectively or to use reasoning processes presupposes fundamental cognitive skills. Skills in observation, classification, seriation, and spatial relationships, for example, are entailed in all deductive and inductive arguments. These skills don't just evolve naturally over the years in all children. They must be taught. And along with other "skills," they must be taught with some relationship, one to the other.

Reasoning as Metaphor and Curriculum Design

It would seem that if the social studies curriculum could address skills in a direct and coordinated way, it would make a significant contribution to the objective of reasoning. Because of the nature of human thought and reasoning, we might,

first of all, consider reasoning as a metaphor toward which we can direct attention. Reasoning is like the notion of quality or life or love in that we can approach it through analogy. That is, we can speak to some attributes of the main concep' but certainly not to all attributes. "Reasoning," like "quality" is too pervasive to hold to a single definition (that is without destroying the concept) and this situation presents us with an interesting curriculum challenge... how can we organize and teach something that is so pervasive and begs definition?

One answer to this problem may be to organize those skills which we can delineate in such a way so as to teach <u>toward</u> reasoning. For example, when we discuss the statement; "your life is like a river," we are using the "river" to move toward, to understand and deal with "life." Allegorically, "reasoning" is to life as the river is to the "skills" that we can list and work with in curriculum building. Another way to picture this situation would be to think of a particular organization of skills as being more powerful than another organization of skills in its ability to develop reasoning abilities. It is this more powerful arrangement that we are after. The conceptual design of this arrangement of skills rests upon the assumption that reasoning ability is a function of our competency in working with <u>skill combinations</u>. This, perhaps, seems like a truism, but the point of extension in this discussion is to suggest a systematic ordering of skills for a more manageable teaching/learning situation. The classification of skills into labeled categories is somewhat arbitrary, but, this placement is based upon the notion that some skills, by their very nature are more inclusive (of other skills). This simply means, for example, that the ability to "infer" carries with it the ability to "classify." Thus, the rationale for a particular arrangement of skills is based upon this factor of inclusiveness. It is, in essence, a classification scheme from s.mple to more complex mental operations. Further, the so called "higher" order operations <u>depend</u> upon the "lower" skills for support and

integrity. Those which are designated as "higher order" require more systematic relationships with other skills. Reasoning, of course, is placed highest of all as it is seen here as most inclusive.

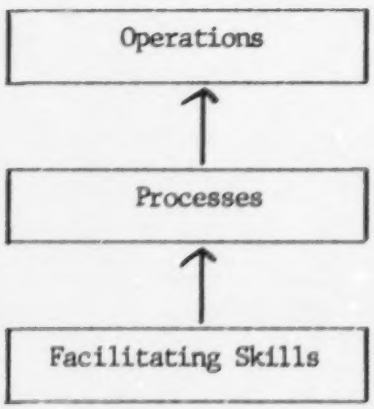
A Skill Network

The phrase, "skill network" is used here to denote a special design or organization of skills that can help us move toward the objective of reasoning. There are three major levels of skills that function as a taxonomy in this design. The lowest level is labeled facilitating skills[10] and include the skills of observation, classification, seriation, and spatial relationships. The second level is called processes[11] and includes inferring, predicting, measuring, formulating definitions, formulating questions and hypotheses, testing hypotheses, and formulating models. The third level is labeled operations[12] and includes search, group participation, communication, quantitative/interpretive skills, and social judgment. Together, the three levels move us toward reasoning.

The specific skills within each level, for example, the skill of classification within the category of facilitating skills, should be seen as related to reasoning in a direct way. The argument is made, throughout, that the specific is always seen in terms of the whole.

The notion, of "the specific in terms of the whole" will be developed below when we take a more careful look at one facilitating skill... classification. Classification is fundamental, and in most advanced forms of thinking, it is crucial. Ideally, training in various aspects of classification will enhance the development of reasoning skills. For example, we use classification skills as we decide on how to handle a certain problem. Classification has to do with the way reasoning fits the topic, question, or problem under consideration. If we ask whether this community is a "good place in which to live" we must use a type of reasoning which is different from the process used to ask whether "Mary started

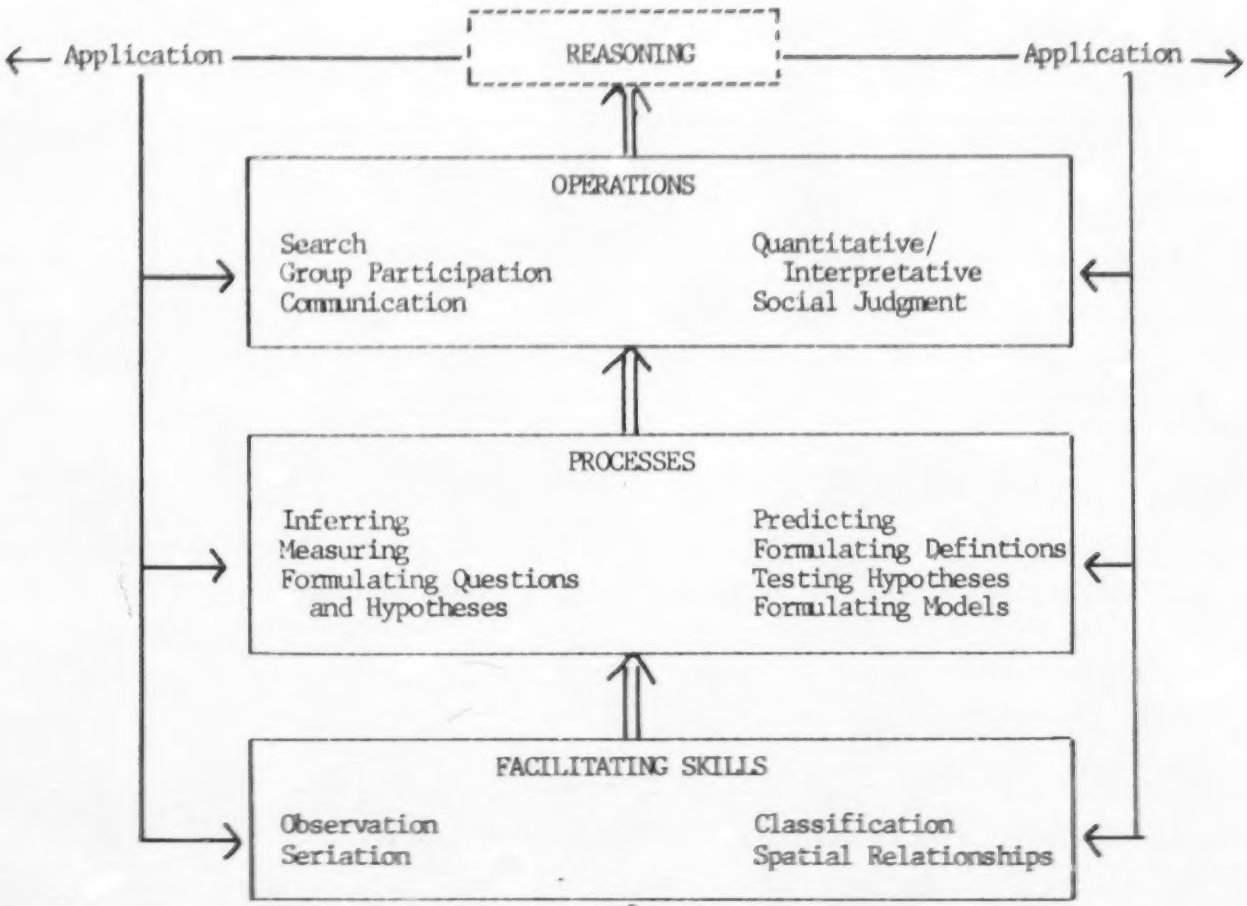
the fight on the playground." Or to put it another way, it takes a different set of skills to argue that something is either true or false... where there is no third possibility, than it does to argue along a continum from excellent to poor. In the former case, we are saying something is either valid or not, but in the latter case we are arguing in relationship to a standard of quality. According to the rules of basketball, team A won the game (either team A won or team B won). This is a different question from "which ballplayer was most valuable?" The ability of an individual to reason effectively in both cases above, as well as in other situations, calls attention to the need to develop competencies in several skill categories.



As stated above, skills are placed in levels in this network based upon the criterion of inclusiveness. That is, the more inclusive (of other skills) the "higher order" is attributed to it and this quality places the skill in a particular category. The three levels, of facilitating skills, processes and operations, in concert, provide the material substance for reasoning.[13] The three levels of skills delineated here suggest a taxonomy for the development of reasoning abilities. The operations (of Search, Group Participation, Communication, Quantitative/Interpretive abilities, and Social Judgment) depend upon the various social studies processes (of inferring, predicting, measuring, formulating definitions, formulating questions and hypotheses, testing hypotheses and formu-

lating models) for substance. In turn, these processes depend upon the facilitating skills (of observation, classification, seriation, and spatial relationships) for existence. For example, when reading skills or map and globe (or any other social studies operation) skills are being developed the student must make use of facilitating skills and social studies processes. Thus, in any map or globe activity the student may observe, classify, explain spatial relationships; measure, infer and formulate a hypothesis. Practice with facilitating skills and social studies processes becomes necessary if we expect students to be competent with skills in the category labeled "operations." Competency in any skill category is a function of ones competencies in the supportive or lower categorie(s). We cannot be competent in using social studies processes, for example, unless we are competent in using facilitating skills.

A Skill Network



The important notion in this network of skills is the interrelatedness and interdependence of the three levels as they provide the substance for reasoning. In teaching the "operation" of communication (reading, for example), students continually make use of all processes. All competent readers formulate hypotheses as they read and then test these hunches as they read on. A good reader is always trying to anticipate the author, and as he or she reads through the narrative, hypotheses about where the author is going are continually set up and tested. Systematic attention to this process as well as the other social studies processes is fundamental to better reasoning (comprehension).

Similarly, the facilitating skills of observation, classification, seriation, and spatial relationships are instrumental to hypothesis formation as well as to all other processes. Of particular concern, however, are the ways in which these facilitating skills are perceived and presented by teachers. It is extremely important that a clear understanding of these skills be part of all social studies teachers' knowledge. To use an analogy, the facilitating skills, processes, and operations are like the information in the playbook that a professional football quarterback uses. Depending upon the situation and game condition, the quarterback will pick, blend, and sequence plays so as to score. Likewise, the teacher, depending upon the situation, can pick, blend, and sequence facilitating skills, processes, and operations so as to have students achieve better reasoning ability.

It should also be noted that as students apply "reasoning" to situations of interest and concern, they will, in turn, enhance each of the skill levels. Thus, competency in all skill areas is improved through the application of "reasoning. The selection or sequential arrangement suggests a coordination of skills in this network. It means the teaching of reading and map and globe skills, for example, will depend, in turn, upon the teaching of facilitating skills and processes, not as something that would be nice to do, but as something that is necessary to do. In the operation of this network, special attention will have to be given to each

skill component so that abilities in handling all of the facilitating skills, and processes can be developed. Only when all of these skill levels are addressed can we hope to develop student abilities in reasoning. As an example of the treatment of one facilitating skill, and its relationship to reasoning (the specific is always seen in terms of the whole), the skill of classification will be studied in some depth. Classification is used here because it is so fundamental to reasoning. The disjunctive (syllogism) is not only basic to logic, it is basic to all other operations and to concept formation as well.

We will now consider one skill within the first level (facilitating skills) of the network... the skill of classification. First of all, classification will be discussed in a general way so as we may see its relationship to the skill network. Second, specific types of classification will be presented with examples for classroom utility. Finally, a short discussion on curriculum implications will follow.

Thinking About Classifying

"There is a place for everything and everything should be in its place." How many time have we heard these words?

Whether we like it or not everything does have a place...a place in our thoughts and in our language. In fact, everytime we speak, we put objects, events or people "in their places."

"I'm going to take my vacation this year in Canada." In order to make this statement and expect it to have any meaning, many objects, events and people must be put in their places.

What's a "vacation?"

What's a "year?"

What's a "Canada?"

Who am "I?"

The answers to all of these and other questions related to the statement, "I am going to take my vacation this year in Canada," depend on our ability to place certain items in particular categories. It demands an ability to deal with the physical world and our experiences in it so that such experiences are meaningful. For example, "Canada" is a political and geographic abstraction that carries with it a whole array of attributes. It has a location on earth, a particular political system, natural resources and a special demography, all of which helps us to separate Canada from other nations, or to "put it in its place." "Vacation" is a particular abstraction that denotes a separation from work. Vacation may mean less attention to time schedules, more traveling, new cities to explore, etc. Vacation is "put in its place" and we give it a particular meaning. The terms "year" and "I" are also put in their places by abstracting their relationship to other related ideas.

The ability to create and use sets or categories has a direct bearing on our ability to use skills from the "processes" and "operations" categories. Classification is necessary for hypotheses testing (processes) as well as for making social judgments (operations). Thus, as we practice classification, we are indirectly working on other skill categories as well. This is the case with all skills in the taxonomy... they support and reinforce each other.

The notions of abstraction, judgment, truth, and the skill of classifying are related in interesting ways. For example, people often speak of the "real world" as something we should prepare for in school. But, what is this "real world?" Is the real world the solid earth or the solid chair on which you are sitting? It must be real for we can touch and measure these items. But we also know enough about science to understand that the "solid" chair is made up of intricate cells composed of more space than matter. And, the earth is a moving fluid mass which cracks and shrinks and continually reshapes itself. Is the real world that world

inside the nucleus of each atom or are the stars in the next galaxy the real world? When you think about it, the real world seems to be more like a great thought than an object or collection of objects. Indeed, the real world (reality) which at first glance seems so obvious can slip from one meaning to a new meaning depending upon the abstraction levels and the classification schemes we bring to bear upon objects, events, phenomena and people. We use language, and more specifically, concepts (categories) to dissect our environments. Whether those environments be physical, social, biotic or spiritual, we use categories or sets to place animals here and fish there, electrons here and nuclei there, Germans here and Russians there, etc...everything is in its place. And if there isn't a place for everything, we will create one.

The act of classifying sets into motion one of the simpliest forms of deductive logic... the disjunctive syllogisms... that is, something is either X or Y. But, it also forces the individual to reason about those items or ideas that don't fall neatly into category X or category Y. Sometimes a new category must be invented or created for the situation. When, for example, the automobile was invented, new categories and terms were created. Automobile is, of course, the title of a set or category that contains Fords, Chevys, and Volkswagons. And a Ford contains a motor and wheels and a transmission. And, a motor contains pistons and cylinders ...and so we go. As inventions or new additions are made to our culture or knowledge, new categories must be created. In fact, it may be the case that invention is a function of our ability to create new classifications by seeing something which no one else has seen before or by asking a question no one has asked before. The physical phenomona available to people like Sir Isaac Newton or Albert Einstein were and are available to others. However, these men began to classify items differently. Einstein, for example, saw a relationship between time and speed that suggested a fourth dimension. The categories of time/speed now speak to a new classification with length, width, heighth (and

time) which allows us many new insights into the physical world. Whether we are looking at an Einstein creating a new theory of relativity or a child learning a new term to describe the environment, the skill of classification is fundamental.

Consider what happens when we stumble into a strange environment or come across a strange creature. Where am I? What is it? Is it dangerous here? Will this thing hurt me? But, as soon as we can identify the class or set to which the new item(s) belongs, we assimilate the environment and/or creature by calling up from our memory classes or sets into which these new items can be placed and understood. We do not have the mental ability to treat each new stimulus as a unique entity. Thus, the skill of classification is not only convenient, it is absolutely necessary in dealing with the world.

The ability to classify is basic to all thinking. It is fundamental to proficiency in all other skills such as reading, writing, quantification competencies, etc. The skill of classification is basic to all of these other abilities simply because it is the foundation upon which language use and development is built, and language, in turn is our most fundamental thinking tool.

The labeling process we go through when learning a new word or a new meaning for an old word is fundamental to concept formation and concepts are fundamental to thinking. In essence a concept <u>is</u> a classification...a category. A concept is a categorization of things, events, or ideas. It is a convention; a carrier of meaning; an aid in communication; a tool for thinking; and a helpful guide in bringing order to our world. The concept of "bird" immediately suggests a set or category by which we can separate birds from non-birds. Animals, people, objects, events, phenomena, natural elements must be classified if we are to effectively deal with them. Most useful knowledge has to do with relationships that exist in nature, among people, and between nature and people. Without the acquaintance of a great many classification schemes and the ability to establish criteria for new

categories, individuals cannot grasp relational ties between and among basic concepts. And, of course, without this skill there can be no reasoned thought and no communication.

Classification is an act or thought that sorts objects, events, people and phenomena into groups or sets according to criteria that are consistent, that are agreed upon, that can be communicated and that can be tested according to quantitative and/or philosophical evaluations.

Types of Classifications

Classifications can be made in three and only three ways. These three ways are called the disjunctive (either/or) classification; the inclusive classification; and the some/all classification.

1. DISJUNCTIVE (EITHER/OR) CLASSIFICATION

This type of classification means that A and B are separate. An item "belonging" to one set cannot belong to the other.

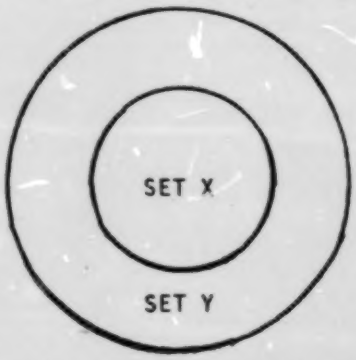
The item is <u>either</u> A <u>or</u> B. The color is red not blue. The tree is tall not short ...etc. Once a category is established...red...tall...etc....items fall within or outside of the set. The letter "A" is not the letter "B"; it is not the letter "C" etc.

We learn the disjunctive classification first. We start using the disjunctive when we begin to distinguish between dad and mom; between dog and cat; and between milk and water. Only later will individuals distinguish between, "my dad

and other men," for example. The disjunctive classification skill is also fundamental to vocabulary development, or what we call concept development and labeling. Children can look at many pictures of animals (or draw pictures of animals themselves), and will eventually with instruction come to label the animals as horse, cow, giraffe, monkey, etc. This process of concept development and labeling (vocabulary development) will allow a student to speak of economic demand, for example, without presenting a long list of attributes. And other students, who have developed similar categories will know that he or she is addressing demand and not supply. Skills of disjunctive classification are fundamental to all other skills in the sense that the ability to establish and use discrete categories is prerequisite to all other skill operations.

2. THE INCLUSIVE CLASSIFICATION

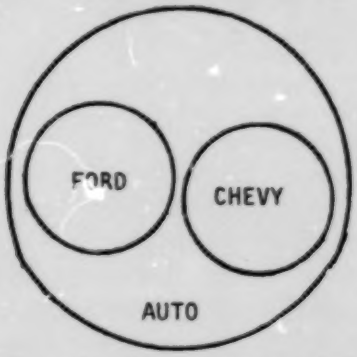
The inclusive classification means that one set is a subset of another set.



The inclusive classification means that set B is found within set A. All robins are part of the category called birds. All Chevys are part of the set called automobiles.

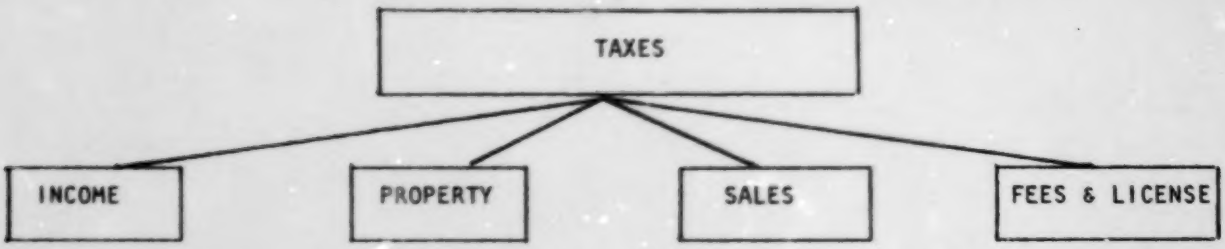
Inclusive classification can move in two directions. First, inclusive classifications can discriminate within a single set. For example, Betsy belongs to the set called cow; cow belongs to the set called animals. This might be drawn as follows:

Second, inclusive classifications can discriminate between and among sets within a larger category. For example, Chevys and Fords belong to the set called automobile. This can be illustrated as follows:



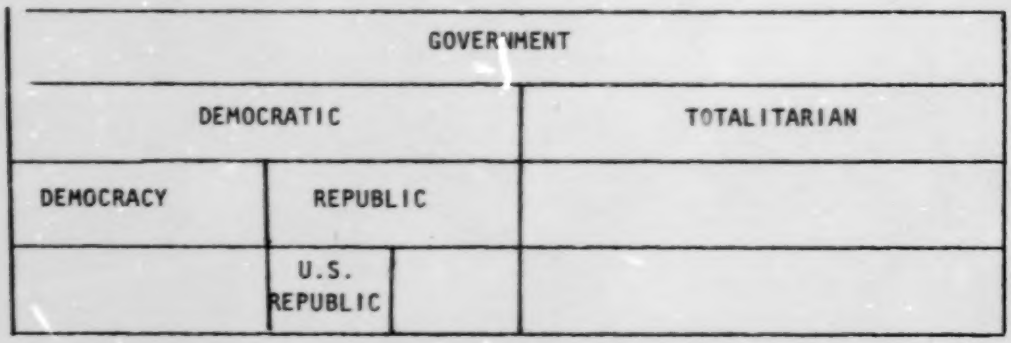
The establishing of sets and subsets is an interesting process for students as it allows for linguistic interrelations which is the foundation of all reasoning ability. Few, if any, objects, events or people have only one name. And because of this multiple name situation they can be placed in more than one category. Further, when we are asked to define something we usually give it another name. We describe a Dodge as an automobile, a robin as a bird, and Mark Twain as a writer. In each case, we place items into a larger category. The point of classification process is to suggest areas of similarities between the item being "defined" and other items within the same larger category. By saying a robin is a bird, we call attention to the fact that a robin has something in common with crows, hawks, and hummingbirds.

We can often specify a smaller subset to which an item also belongs. A "tax" for example can be referred to as, Income, Property, Sales, etc. And a government can be referred to as a "Democracy."

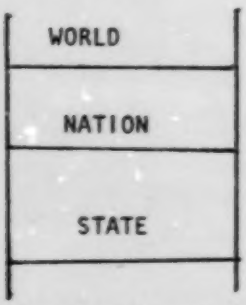


With more names, much more can be said about an item.

Categories can be related in such a way that items may be seen as higher order or lower order depending on what is being compared. "U.S. Republic" is subordinate (lower order) to Republic, but Democratic is superordinate (higher order) to Republic.



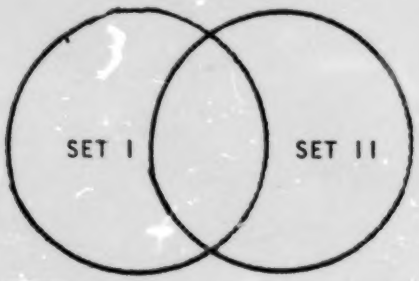
The skill can also be seen as the ability needed in dealing with abstractions. Consider:



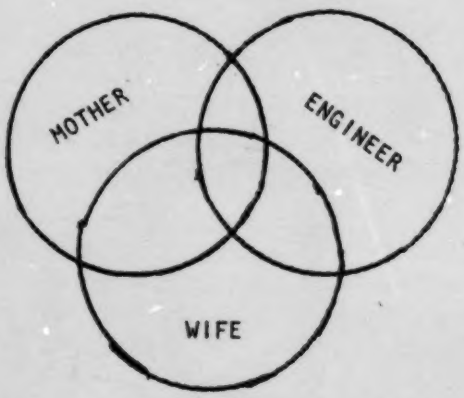
Moving from lower to higher levels of abstraction and back again is essential to such skills as writing a paragraph or establishing a taxonomy. And, like the disjunctive classification, it is basic to all other skill operations. For example, when a child makes distinctions within particular sets, making explicit the relationship between said set and a sub-set, he or she is taking the first step toward understanding how items abstractly relate to one another. Children begin to see

how their family relates to the abstract notion of "family" as opposed to the category called "community." This ability is necessary to all reasoning.

3. THE SOME/ALL CLASSIFICATION



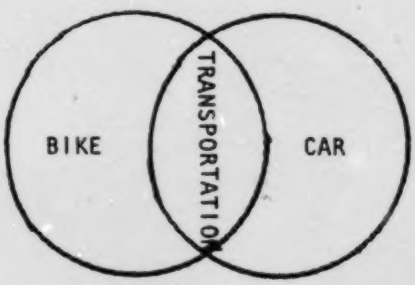
The some/all classification is the most difficult classifying skill to master in that it calls for the ability to discriminate between different sets when these sets overlap. The sets: student/athlete; work/play; son/brother; wife/mother are, examples of concept pairs which share some attributes and yet have other attributes which are unique. The concepts of 'wife' and 'mother' carry some similar, yet many different attributes. The roles of wife and mother suggest similar attributes of being female, a particular age achievement and emotional and physical involvement with other people. However, there are unique attributes to the roles, such as the one dealing more with a legal or social role and the other more with a biological fact. In essence one person can be both a wife and a mother and at times the roles will seem to coincide and at other times the roles will be quite different. The same individual could be a wife, a mother, and a nuclear engineer. Again, there are overlaps of roles that might look like this:



Clearly, the same individual can classify her life as a series of overlapping sets and can gain insights into her total "person."

The pickup truck that is used as the family car and the business truck will have common attributes as well as those attributes that are unique to family cars or to business trucks. The ball that can be used for soccer as well as for volley ball, the insect that can fly or walk, the ship that can float on the sea or under it, the baseball player who also plays basketball...all are examples of some/all classifications.

A useful way to think of some/all classifications is to consider that they can be made in two different ways. First of all, the classification of one item can be made depicting two or more functions, i.e. the automobile which can be used as a car or a truck; a bird and a bear can share the attributes of walking, etc. Second, some/all classifications can be made of different items that perform similar functions. For example, a car and bike share the function of transportation. Thus, the concept of transportation can be developed through classification activities.



Thus, some/all classifications can be made relative to the same item with different functions, as well as with different items that have similar functions.

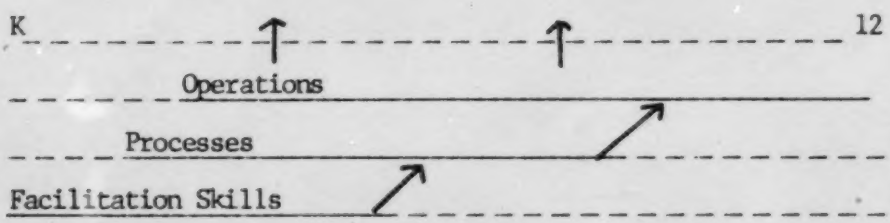
This presentation of classification should suggest, again, the fact that the part (classification) is developed in terms of the whole (reasoning). The metaphor of reasoning allows teachers to help students relate all specific facilitating skills, processes, and operations to reasoning and its application.

Curriculum Implications

The curriculum implications of this skill network are particularly appropriate to the elementary social studies program, although its utility can be seen K-12. One of the problems which elementary educators face is the fragmentation of the content (including skills). Spelling gives way to arithmetic, which gives way to social studies, etc. The skill network can provide a common base of skill (using social studies as a core) development. This is the case since the skill network contains those skills appropriate to all content areas. The skills contained in the network can serve as a unifying curriculum force. For example, in the early elementary grades, attention can be given to the skills of observation, classification, seriation, and spatial relationships not only in social studies but in all content areas. This practice would add a great deal of efficiency to the instructional process. Instead of dealing with different skills in each discipline (many of which turn out to be the same) it is possible to consciously teach (place emphasis upon) those common skills which point to a common objective... reasoning.

As teachers use the social studies processes, they will begin to see them as dependent notions... dependent upon the facilitating skills. And, as teachers use operations, they will see them as dependent upon processes. Finally, as curriculum workers develop skill patterns for inclusion in the social studies program, they might find the following scheme useful:

The Objective of Reasoning



This curriculum pattern for skill development pointing toward the objective of reasoning suggests that the three levels of skills function together as they

move from kindergarten through the twelfth grade. They are continually interacting with one another and in concert address the objective of reasoning. Notice should be made of the placement of facilitating skills "first," processes "second," and operations "third." However, it should be clear that the flow from one level to the next and back again should be encouraged. Certainly, in the secondary school programs more attention might be given to "operations," but this would depend upon students' abilities in the other two skill levels. Thus, the teacher may find it necessary to move back and forth across all three levels with great regularity.

A structure for curriculum, then, may be established as suggested above, but teachers will have to maintain a flexibility appropriate to the students' abilities and content involvement.

Conclusion

In addition to classification, all other facilitating skills, processes and operations need to be understood as interrelated. The type of skill coordination suggested by the "network" should allow for greater efficiency in the teaching/learning process due to the reinforcement that will take place as students work with facilitating skills, processes, and operations. This coordination of skills should help students in their reasoning ability since it will force them into linguistic/symbolic manipulations.

As each skill area is developed in some depth, as with "classification" above, teachers will note the growing relationship among all skills, and this knowledge can improve instructional decision-making and student reasoning abilities. However, there are several questions still unanswered relative to a skill network. For example, can we sequence learning activities from the facilitating skill group to reasoning according to the maturity of students? Can one skill network work for students from different socio-economic groups? What happens when different content themes are used as vehicles for skill development?

These and many other questions about teaching and learning skills need to be explored. Again, what is presented here is one organizational scheme for skill development that points us toward one basic rationale of social studies education ...reasoning.

FOOTNOTES

1. This emphasis upon skill development is seen, for example, in many recent publications dealing with reading in the content area. There are also specific works such as Developing Decision-Making Skills, 47th Yearbook of the National Council of Social Studies, 1977, Dana Kurfman, ed.; and Skills In Citizen Action, F. Newmann, T. Bertocci and R. Landsness, Citizen Participation Project, School of Education, University of Wisconsin-Madison, 1977 which show this concern for skills.

2. In informal comparisons of selected performers' scores on reading comprehension tests, where scores on specific inferential comprehension objectives was low, with performance on non-print cognitive development tasks requiring cognitive skills which many would presume to underly performance on linguistically-oriented counterparts, results suggest that many readers haven't the reasoning ability to perform cognitive tasks to begin with. Reading test then tells us nothing (with any diagnostic precision) about these performers.

3. Moffett, J. and Wegner, B. J. Student-Centered Language Arts and Reading, K-13, Boston: Houghton-Mifflin, 1976.

4. Lockhead, Jack and Clement, John (ed.) Cognitive Process Instruction, the Franklin Institute Press, Philadelphia, Penn. 1979

5. Ennis, R. and Paulus, D. Critical Thinking Readiness in Grades 1-12, Phase I: Deductive Reasoning in Adolescence, Ithaca: Cornell University, 1965.

6. Klein, M. Inferring From The Conditional: An Exploration of Inferential Judgments By Students at Selected Grade Levels. Unpublished dissertation, University of Wisconsin-Madison, 1973.

7. Shapiro, B. and O'Brien, T. "Logical Thinking in Children Ages 6-13." In Child Development, September 1970, 41, 823-829.

8. Klein, M. Inferring From The Conditional: An Exploration of Inferential Judgments By Students at Selected Grade Levels. Unpublished dissertation, University of Wisconsin-Madison, 1973.

9. Ennis, R. and Paulus, D. Critical Thinking Readiness in Grades 1-12, Phase I: Deductive Reasoning in Adolescence, Ithaca: Cornell University, 1965.

   See also Roberge, J. "A Study of Children's Abilities to Reason With Basic Principles of Deductive Reasoning." In American Educational Research Journal, November 1970, 7, 583-596.

10. FACILITATING SKILLS - Facilitating skills are those operations that are necessary in performing any social studies processes or mastery of the basic skill areas. Observation, classification, seriation, and spatial relationships are fundamental to inferring or predicting or any other of the social studies processes. But facilitating skills also provide the foundation for basic skill development. That is, reading cannot take place, for example, unless the student can perform the operations of observation, classification, seriation, and spatial relationships.

a) OBSERVATION - Observations can be made in a variety of ways using all of the senses. Where direct sense experience is not adequate for making needed observations, indirect methods are used. Objects and events may be observed with respect to many qualities and quantities. When observations are made in order to accumulate data from which inferences will be drawn, the precision of the observations is critical. Observations are influenced by the experience of the observer.

Social observation can take many forms - from viewing a national political convention on television to watching two children behaving on the playground. Observation can be very directive, as when looking for specific events (factual or procedural); or it can be very nondirective, as when viewing an event and giving an opinion.

b) CLASSIFICATION - Classifying is the grouping of phenomena according to an established scheme. Objects and events may be classified on the basis of observations. Classificational schemes are based on observable similarities and differences in properties which are arbitrarily selected. Classificational keys are used to place items within a scheme as well as to retrieve information from a scheme.

Social classification is manifest in discussing the division of work in the house, or the makeup of a national political party. Classification is useful in that it helps limit or control the data being investigated.

c) SERIATION - Seriation deals with the ability to place items in order. Items, events, or phenomena can be ordered according to time, size, quantity, quality, levels of abstraction, etc.

d) SPATIAL RELATIONSHIPS - Spatial relationships deal with the way in which one item is spatially located relative to another item. Spatial relationships address concepts of location, mass, width and length, as well as size. Concepts which are generally used in describing spatial relationships include north, south, etc. as well as above, below, against, through, etc.

11. SOCIAL STUDIES PROCESSES - The following socials studies processes are necessary to include in the social studies program if the basic skill areas are to be achieved or mastered by students. The seven delineated processes defined below are appropriate for each basic skill area and should be a central part of the student's skill work in any social studies program.

a) INFERRING - Inference is drawing tentative conclusions about what is not directly or immediately observable. While it may be based on observations, inference requires evaluation and judgment. Inferences based upon one set of observations may suggest further observation which in turn requires modification of original inferences. Inference leads to prediction. In the social studies, inferring can take place whenever data are reviewed and an evaluation or judgment is requested. Inferring is necessary in any field of study because of the incompleteness of data.

b) PREDICTING - Predicting is the formulation of a possible consequence based on experience. The reliability of prediction depends upon the accuracy of past observations and upon the nature of the event being predicted. Predictions are based upon inference. Social predicting is becoming more systematic. Predicting may enable man to estimate the consequence of his behavior better and to make more rational decisions.

c) MEASURING - Measuring properties of objects and events can be accomplished either by direct comparison, or by indirect comparison with arbitrary units. However, for purposes of communication, measurement may be standardized. Measuring in the social studies may take many forms, such as population data of the United States or the Gross National Product.

Interpreting data requires the applications of other basic processes, in particular, the processes of inferring and predicting. Through this complex process the usefulness of data in answering the question being investigated is determined. Interpretations are always subject to revision in the light of new or more refined data. Social problem solving is dependent upon the investigator's ability to interpret data. Through interpreting data we move to decision-making (e.g., voting for candidate X or Y; buying more life insurance).

d) FORMULATING DEFINITIONS - Definitions are made in order to simplify communication concerning the event, person, or group being studied. A definition should contain the minimum amount of information needed to differentiate that which is being defined from other similiar phenomena under investigation.

e) FORMULATING QUESTIONS AND HYPOTHESES - Questions are formed on the basis of observations made and usually precede an attempt to evaluate a situation or event. Questions when precisely stated are problems to be solved through application of the other inquiry skills of the social studies. The attempt to answer one question may generate other questions. The formation of hypotheses depends directly upon questions, inference, and prediction. It consists of devising a statement that can be tested by a proof processes. When more than one hypothesis is suggested by a set of observations, each must be tested separately. A workable hypothesis is stated in such a way that testing can establish its credibility. The inquirer's framework of concepts and generalizations influences the kind and quality of the questions and hypotheses he develops. In the social studies, if the generalization, "If labor is divided, then work is done more efficiently," is testable, it can be called or labeled a hypothesis.

f) TESTING HYPOTHESES - Testing hypotheses is the process of designing and using data gathering procedures, determining whether the data support the hypothesis. In a less formal sense, the proof process may be conducted simply by making observations. However, even here a plan to relate premises to data is inherent in the process. Among the ways that hypotheses are tested in the

social studies are: (1) determining whether the hypothesis agrees with data gathered about persons, events, or situations in other times and places; (2) determining whether the hypothesis is consistent with additional data gathered about the event or situation under study; and (3) determining whether the hypothesis agrees with accepted generalizations.

g) FORMULATING MODELS - Models, whether physical or mental, are devised on the basis of acceptable hypotheses, or upon hypotheses that have yet to be tested. Models are used to describe and explain the interrelationships of ideas. In many cases the model implies new hypotheses and if testing these hypotheses gives new information, the model must be altered. Examples of model formation in the social studies are: a map, a drawing of an economy's spending system, and a diagram of the political structure of a country.

12. BASIC SOCIAL STUDIES OPERATIONS - The basic social studies operations become the focus of skill work in the social studies program. They are learned patterns or complexes of the social studies processes. At all levels, students should be developing their ability to use these basic operations.

a) SEARCH - Searching is the purposeful process of asking questions, gathering data and interpretations, judging relevancy and sufficiency, finding answers, and drawing conclusions. In the social studies, search is a constant focus as issues, inquiries, and dilemmas are addressed. Searching becomes more formal as students prepare oral and written presentations.

1. Questioning - factual, interpretive, evaluative

2. Gather, observe, and organize information from a multiplicity of sources

   a. Design investigations
   b. Use the Dewey decimal system, Readers Guide, and other information cataloging systems
   c. Locate and use reference materials productively
   d. Survey, experiment, observe, poll, and interview
   e. Recognize main ideas, note unusual information, check definitions and terms, select most relevant information, and paraphrase
   f. Record sources of information and develop note-taking system
   g. Search for missing information or supportive ideas

3. Evaluate information gathered

   a. Identify and interpret basic premises and theses
   b. Identify and interpret cause and effect relationships
   c. Distinguish fact from opinion
   d. Compare, contrast, and classify to recognize similarities and differences
   e. Recognize and judge bias, emotion, and motivation

f. Cross-reference ideas and information
g. Judge the integrity and sources

4. Presenting information

a. Formulate generalizations, valid inferences and thesis
b. Substantiate ideas using gathered data and logic
c. Use quotations and citation of sources
d. Develop introduction, body, and conclusion to make presentation an original work
e. Strive for good form, good grammar, and academic charm
f. Assume responsibility for final product

b) GROUP PARTICIPATION - Group participation operations are those methods used by people as they interrelate and cooperate in accomplishing a task. The individual contributes to the group and receives from it. Students and citizens have a responsibility to relate effectively as they function in groups, be those groups communities, families, religious institutions, business institutions, school classes, civic/social organizations, or peer groups. The skills of leadership, effective interaction, and participation are fundamental to the social studies program. The classroom and school should be a central location to develop and practice group participation.

1. Take various roles, including leadership, in group work

2. Define the task and design strategies for work

3. Listen to, and be accepting of, people's differences and point of view

4. Take turns, share responsibility, be considerate of others, and show enthusiasm

5. Contribute to discussion in large and small groups

6. Present, communicate, or take action on group decisions

7. Give and accept constructive criticism

8. Reach conclusions and be prepared to vindicate them

c) COMMUNICATION - Communication is the ability to receive and give information, ideas, and values. Individuals and groups transmit messages and preserve knowledge with symbols. Fundamental to any communication is the ability to conceptualize. Then through listening, speaking, gesturing, reading, writing, art forms, etc., people can exchange symbols, values and ideas. Special areas of study have specialized language and while special and technical languages exist, the educated citizen needs to understand the common civic, social and economic language(s) of his or her society and the world.

1. Conceptualize and draw upon vocabulary

2. Read many types of writing with comprehension

3. Read critically

4. Communicate through oral exchange and reports

5. Take notes, outline, and prepare written expressions and reports

6. Listen for a purpose

7. Brainstorm and share ideas

8. Take notes, outline, and communicate through essays

d) QUANTITATIVE/INTERPRETIVE - These operations address the ability to interpret and create models and other symbolic representations of social data. In order to manage the large quantities of data in the modern world the citizen must develop disciplined thinking relative to social knowledge and phenomena, and must know how to organize, interpret and present data in the most effective and efficient ways.

1. Formulate and use models

2. Map and globe skills - symbols, direction, location, interpretation

3. Read, interpret, and construct graphs, charts, drawings; pictures and cartoons

   a. Describing data through the use of frequency tables and measures of central tendency
   b. Using ordered pairs to locate points on a graph
   c. Determining appropriate graphing or presentation techniques for given sets of data
   d. Making predictions from data
   e. Choosing appropriate sample(s) from which to collect data needed to describe a general situation
   f. Using estimation in making comparisons
   g. Measuring
   h. Reading and making charts and graphs
   i. Observing directly and recoding or describing observations
   j. Reading and using ratios and index numbers
   k. Recognize how judgments affecting estimations may be influenced by an individual's perspective
   l. Select effective, efficient mode for presenting data/information to various audiences

e) SOCIAL JUDGMENT - All decisions which effect other human beings carry with them the rights and obligations of any contract complete with reverences to the high ideals of human rights and

social justice. Social judgment requires the ability to make ethical and rational decisions within all of the various social and physical environments in which we live.

Social judgment includes those skills necessary for making, influencing, and judging the decisions of self and others. It means that the first and most important step toward ethical/ rationale civic behavior is knowledge of and reason for the social contracts within which all people live.

1. Relate past and present; cause and consequence

2. Apply jurisprudential reasoning

3. Make commitments, exercise rights, and exert influence in a responsible manner

4. Apply cost and benefit analysis

5. Recognize bias, emotion, and motivation

6. Arrive at reasoned, ethical decisions and value positions and evaluate their social consequences

7. Preserve human dignity in human relations

8. Accept responsibility and recognize human rights

13. REASONING (basic argument forms)

a) DEDUCTIVE ARGUMENTS

1. If all of the premises are true, then the conclusion must be true

2. All of the information or factual content in the conclusion was already contained, at least implicitly, in the premises.

b) INDUCTIVE ARGUMENTS

1. If all of the premises are true, then the conclusion might be true, but not necessarily

2. The conclusion concains information not present, even implicitly, in the premises

c) ANALOGICAL ARGUMENTS - Arguments relating to or based upon analogy, i.e. if two or more things agree with one another in some respects they will probably agree in others. The existence of a correspondence between the members of pairs or sets of linguistic forms that serves as a basis for the creation of another form.